## CLAIMS

We claim:

1. An apparatus for excluding ferromagnetic and magnetic objects from proximity to an MRI instrument, comprising:

an array of sensors adapted to sense a magnetic field of an object;

a processor adapted to interpret signals from said sensor array sensing said magnetic field to detect said object; and

a scanner chassis on which said sensor array is mounted, said scanner chassis being adapted to position the entirety of said sensor array in proximity to all portions of a human subject, said scanner chassis being adapted to orient said sensor array to distinguish between a background magnetic field and said magnetic field of said object.

2. The apparatus recited in claim 1, wherein:

said object is a "soft" ferromagnetic object; and

said magnetic field comprises an induced magnetic field caused by magnetization of said ferromagnetic object by an external magnetic field.

3. The apparatus recited in claim 1, wherein said object comprises a permanently magnetic object.

4. The apparatus recited in claim 1, wherein said processor is further adapted to interpret signals from said sensor array sensing said magnetic field to characterize said object.

5. The apparatus recited in claim 1, wherein said processor is further adapted to interpret signals from said sensor array sensing said magnetic field to locate said object.

6. The apparatus recited in claim 1, wherein said scanner chassis comprises a portal structure, said portal structure having at least first and second vertical members, one of said vertical members being arranged on each side of a passageway adapted for passage of a recumbent human subject.

7. The apparatus recited in claim 6, wherein:

said sensor array comprises at least first and second sensor sub-arrays;

said first sensor sub-array is arranged horizontally on said first vertical member on a first side of said passageway;

said second sensor sub-array is arranged horizontally on said second vertical member on a second side of said passageway; and

said first and second sensor sub-arrays are positioned at a height matching a selected height at which said recumbent human subject will pass through said portal structure.

8. The apparatus recited in claim 6, wherein:

said portal structure further comprises a horizontal member spanning said passageway between said first and second vertical members;

said sensor array comprises at least one sensor sub-array arranged horizontally on said horizontal member; and

said sensor sub-array is arranged above said passageway, at a height above, but in close proximity to, a selected height at which said recumbent human subject will pass through said portal structure.

9. The apparatus recited in claim 8, wherein:

said horizontal member has a scanning position spanning said passageway at an intermediate height relative to said first and second vertical members, said scanning position limiting the clear height of said passageway between said first and second vertical members to said intermediate height; and

said horizontal member has a non-scanning position, said non-scanning position not spanning said passageway at said intermediate height, said non-scanning position increasing said clear height of said passageway to allow passage of an upright human subject through said portal structure.

10. The apparatus recited in claim 9, wherein:

said sensor array comprises at least three said sensor sub-arrays;

a first said sensor sub-array is arranged horizontally on said horizontal member;

a second said sensor sub-array is arranged vertically on said first vertical member;

a third said sensor sub-array is arranged vertically on said second vertical member; and

when said horizontal member is in said non-scanning position, said second and third sensor sub-arrays are adapted to scan said upright human subject passing through said portal structure.

11. The apparatus recited in claim 1, wherein said scanner chassis comprises a hand-held frame.

12. The apparatus recited in claim 11, wherein:

said object is a "soft" ferromagnetic object; and

said magnetic field comprises an induced magnetic field caused by magnetization of said ferromagnetic object by an external magnetic field.

13. The apparatus recited in claim 12, further comprising a source of said external magnetic field mounted on said hand-held frame.

14. The apparatus recited in claim 13, wherein said source of said external magnetic field comprises a permanent magnet.

15. The apparatus recited in claim 13, wherein said source of said external magnetic field comprises an electromagnetic coil.

16. The apparatus recited in claim 15, wherein said electromagnetic coil is driven by a DC source.

17. The apparatus recited in claim 15, wherein said electromagnetic coil is driven by an AC source.

18. The apparatus recited in claim 17, wherein said AC source operates at a frequency less than about 1000 Hz.

19. The apparatus recited in claim 13, wherein said sensor array comprises at least two sensors, said at least two sensors being arranged symmetrically relative to said magnetic field source, said at least two sensors being connected to cancel out their respective signals resulting from exposure to the flux of said magnetic field source.

20. The apparatus recited in claim 19, wherein said at least two sensors comprise induction coils.

21. The apparatus recited in claim 20, wherein each said induction coil is wound on a magnetically impermeable core.

22. The apparatus recited in claim 20, wherein each said induction coil is wound on a magnetically permeable core.

23. The apparatus recited in claim 19, wherein said at least two sensors comprise magnetometers.

24. An apparatus for excluding ferromagnetic objects from proximity to an MRI instrument, comprising:

a portal structure, said portal structure having at least first and second vertical members, one of said vertical members being arranged on each side of a passageway adapted for passage of a recumbent human subject, said portal structure having a horizontal member spanning said passageway between said first and second vertical members;

an array of sensors arranged horizontally on said horizontal member, said sensor array being adapted to detect an induced magnetic field caused by magnetization of a ferromagnetic object by an external magnetic field, said sensor array being adapted to distinguish between a background magnetic field and said induced magnetic field of said ferromagnetic object, said sensor sub-array being arranged above said passageway, at a height above, but in close proximity to, a selected height at which said recumbent human subject will pass through said portal structure; and

a processor adapted to interpret signals from said sensor array to detect said ferromagnetic object according to said induced magnetic field.

25. The apparatus recited in claim 24, wherein:

said horizontal member has a scanning position spanning said passageway at an intermediate height relative to said first and second vertical members, said scanning position limiting the clear height of said passageway between said first and second vertical members to said intermediate height; and

said horizontal member has a non-scanning position, said non-scanning position not spanning said passageway at said intermediate height, said non-scanning position increasing said clear height of said passageway to allow passage of an upright human subject through said portal structure.

26. The apparatus recited in claim 25, further comprising first and second vertical sensor arrays, wherein:

said first vertical sensor array is arranged vertically on said first vertical member;

said second vertical sensor array is arranged vertically on said second vertical member; and

when said horizontal member is in said non-scanning position, said first and second vertical sensor arrays are adapted to scan said upright human subject passing through said portal structure.

27. An apparatus for excluding ferromagnetic objects from proximity to an MRI instrument, comprising:

a hand-held frame;

a magnetic field source mounted on said hand-held frame;

an array of at least two sensors mounted on said hand-held frame, said array of sensors being adapted to detect an induced magnetic field caused by magnetization of a ferromagnetic object by a magnetic field from said source, said at least two sensors being arranged symmetrically relative to said magnetic field source, said at least two sensors being connected to cancel out their respective signals resulting from exposure to the flux of said magnetic field source;

a processor adapted to interpret signals from said sensor array to detect said ferromagnetic object according to said induced magnetic field.

28. The apparatus recited in claim 27, wherein said source of said magnetic field comprises a permanent magnet.

29. The apparatus recited in claim 27, wherein said source of said magnetic field comprises an electromagnetic coil.

30. The apparatus recited in claim 29, wherein said electromagnetic coil is driven by a DC source.

31. The apparatus recited in claim 29, wherein said electromagnetic coil is driven by an AC source.

32. The apparatus recited in claim 31, wherein said AC source operates at a frequency less than 1000 Hz.

33. The apparatus recited in claim 27, wherein said at least two sensors comprise induction coils.

34. The apparatus recited in claim 33, wherein each said induction coil is wound on a magnetically impermeable core.

35. The apparatus recited in claim 33, wherein each said induction coil is wound on a magnetically permeable core.

36. The apparatus recited in claim 27, wherein said at least two sensors comprise magnetometers.

37. A method for excluding objects from proximity to an MRI instrument, said method comprising:

providing an array of sensors adapted to detect a magnetic field of an object;

positioning the entirety of said sensor array to scan all portions of a human subject;

processing signals from said sensor array to detect said object.

38. The method recited in claim 37, wherein said object comprises a ferromagnetic object having an induced magnetic field, said method further comprising orienting said sensor array relative to a source of an external magnetic field to distinguish between said external magnetic field and said induced magnetic field of said ferromagnetic object.

39. The method recited in claim 37, further comprising:

mounting said sensor array on a portal structure; and

passing a recumbent patient through said portal structure to accomplish said positioning of said sensor array to scan said recumbent human subject.

40. The method recited in claim 39, further comprising:

providing said sensor array as at least two sensor sub-arrays;

mounting a first said sensor sub-array on a movable horizontal member on said portal structure;

mounting a second said sensor sub-array on at least one vertical member on said portal structure;

passing said recumbent patient through said portal structure, beneath said horizontal member, to accomplish positioning of said first sensor sub-array to scan said recumbent human subject;

moving said horizontal member to clear a passageway through said portal structure for an upright human subject, said passageway being adjacent to said at least one vertical member; and

passing said upright human subject through said passageway to scan said upright human subject.

41. The method recited in claim 37, further comprising:

mounting said sensor array on a hand-held frame;

providing a source of an external magnetic field mounted to said hand-held frame;

orienting said sensor array relative to said hand-held frame to distinguish between said external magnetic field and an induced magnetic field of said object; and

passing said hand-held frame over said human subject to accomplish said positioning of said entire sensor array to scan said human subject.